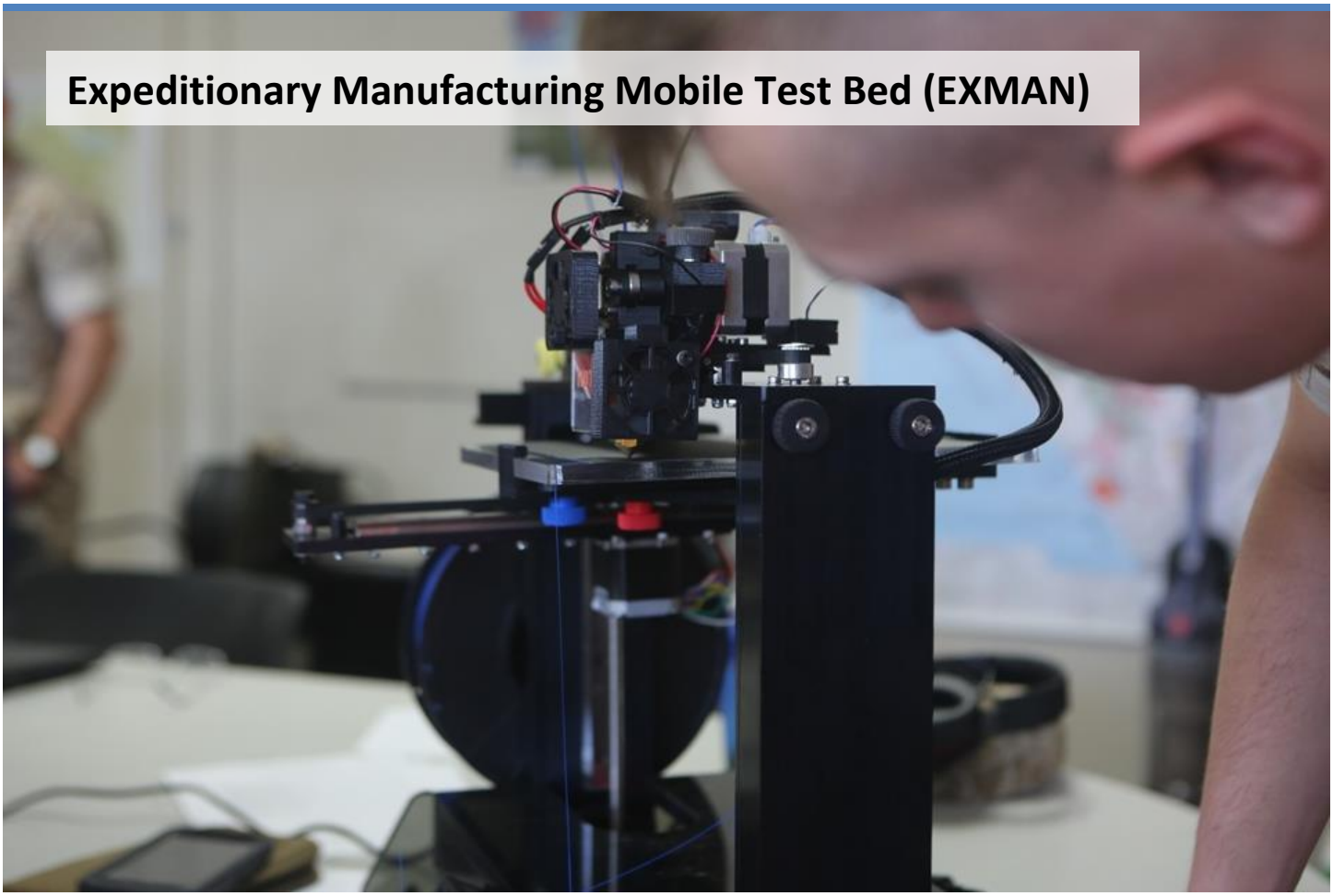
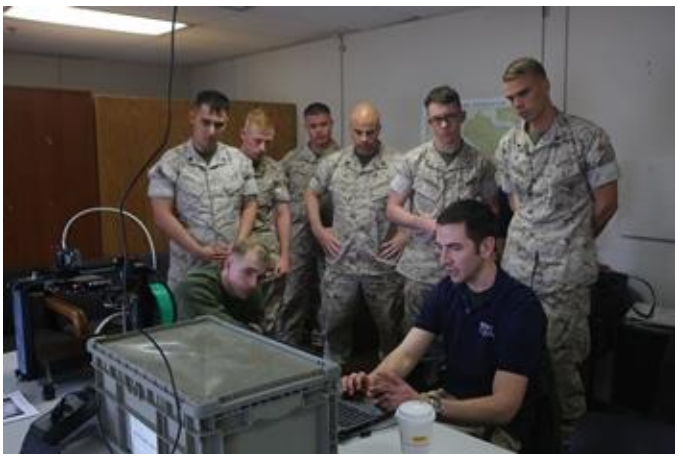
Expeditionary Manufacturing Mobile Test Bed (EXMAN)



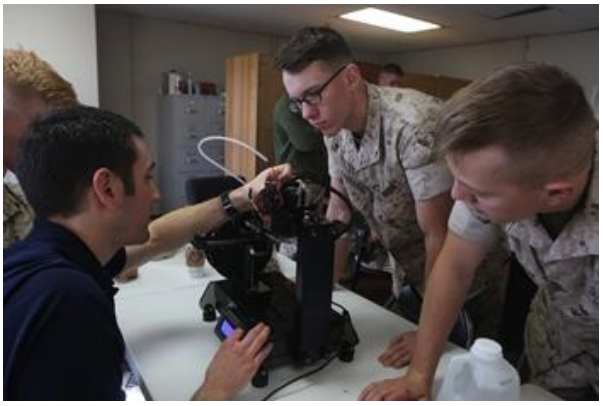
By Maria Kelly Murphy, Office of Strategy and Innovation



CAMP PENDLETON – Ongoing efforts to meet newly emerging and indeterminate requirements of the Navy and Marine Corps in a way that could shave time and costs while meeting expeditionary goals and warfighter needs were met with great applause this month at Camp Pendleton. The Expeditionary Manufacturing Mobile Test Bed (EXMAN) is part of a broader implementation strategy for the SECNAV Innovation Vision. Throughout the last year, LtCol Gregory B. Pace and his Marines have been inspiring a collective understanding of digital manufacturing requirements in the field. Their efforts paid off this month during the Commanding General and Assistant Deputy Commandant for Installations and Logistics (Plans) visits as they were able to show the team building Inventor2 machines.

With the local CBS station in San Diego running an exposé on the merits of potentially integrating 3D printing into the Marine Corps' day-to-day operations, there is a growing public recognition of potentially significant reductions in lead times for the acquisition of mission critical replacement parts. While still in the testing phase, the Marines at Camp Pendleton are producing promising test case results that show possible wait time eliminations of weeks and even months.

The impacts of 3D printing on improving mission-readiness are not lost on the Department of the Navy (DON) organizations who regularly support IT initiatives for our warfighters. An active member of Task Force Innovation, Space and Naval Warfare Systems Command (SPAWAR) is accelerating efforts that they initiated in August 2015 to support additive engineering efforts. Repurposing air traffic control shelters that the Air Force demobilized from Afghanistan, SPAWAR converted them into mobile facilities that could be used by the Marine Corps as Expeditionary Units or the Navy as Embarkable Manufacturing Spaces. The shelters were initially configured to accommodate 3D design software, laser scanning tools, and 3D printing machines, however it became clear that other small scale advanced manufacturing equipment could also be accommodated such as digital CNC routers. Dan Green, SPAWAR HQ (5.0), says, "Everyone is working hard, learning a lot and reducing DON risk for broader adoption of these emerging technologies."



Initial build out and Alpha testing occurred at SPAWAR from November 2015 through February 2016. During that time key players from SPAWAR (Kristin Holzworth and Andrew Bonica), HQMC (LtCol Howard K. Marotto II and Capt Christopher J. Wood) and the 1st Maintenance Battalion (LtCol Gregory B.Pace and WO Sean L. Smith) at Camp Pendleton initiated plans for in garrison deployment and initial "beta" testing.

EXMAN Test Bed 100, (TB-100) was delivered to Camp Pendleton in March 2016. After 12 Marines from the 1st Maintenance Battalion were provided 3D Design and CAD Software training by a SPAWAR master trainer in Solidworks, the three teams of Marines assembled three machines in 3 hours; 2 hours earlier than expected.

If the pieces are plastic, the 3D printed replacements could be used directly. Metal parts could be printed and used as a guide for machinists to quickly and accurately fabricate parts onsite. The effort includes disassembly and reassembly of parts and equipment to develop 3-D models and obtain precise laser scanned measurements. These measurements will also provide support for future quality control and logistics needs.

As an example, on 13 April 2016, the Marines and SPAWAR engineers were visited by MajGen Vincent A. Coglianese from HQMC Installations and Logistics, who was provided a demonstration of the machines in the Shelter. He was shown actual repair parts that the Marines had redesigned, prototyped on 3D printers, and milled overnight on a digital CNC machine in the

local area. This particular failed part, was a recurring problem responsible for keeping Amphibious Assault Vehicle out of commission for, as LtCol Pace mentions, over one hundred days. The demonstrated ability to redesign, prototype, and produce a part in the field in a matter of days represents a significant capability that can augment the traditional supply chain and improve combat readiness.

After the demonstrations and tours, the Commanding General ordered EXMAN TB-100 into the next exercise to test the utility of the EXMAN concept under actual field operating conditions. This may occur as early as August 2016.